중세르네상스영문학
제13권 1호 (2005): 145-161

Cosmos and Eros: Boethius's Cosmology and Post-Copernican Discoveries

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Boethius is seldom discussed in histories of Western cosmology, probably because he generally is considered to be a scholar and a synthesizer rather than a scientist. For example, prior to Boethius, Plato had posited in the *Timaeus* that the regular movement of the heavenly spheres represents perfection for the observer who views them from earth, and Boethius incorporates this Platonic position into the cosmological model that he describes in his *Consolation of Philosophy*. In a recent study, René Brague affirms this view: “Boethius sees the world as the *Timaeus* sees it. And one of the poems that appear in the *Consolation* [Book III, meter 9] constitutes a sort of compendium of Platos' dialogue” (*Wisdom* 138). Beyond this reference in a single paragraph, which refers most specifically to Plato's work, Brague does not develop Boethius's contributions to the field of cosmology any further.

In defining the word *cosmology*, Milton K. Munitz first suggests that "both the observational astronomer and the theoretical cosmologist are studying the universe, though from different vantage points, or that one supplies observational data about the universe that the other undertakes to interpret . . ." The theoretical cosmologist then "constructs a model [based on principles] of the universe and . . . will use his model to interpret the data assembled by the observational astronomer and to guide the astronomer in the search for further data" (239). The observational astronomer from whom Boethius gathers his astronomical data is Ptolemy, whose *Almagest* dates from the 100s A.D., and Ptolemy's cosmological antecedent was Aristotle, whose *Physics* predates his death in 322 B.C.; the "theoretical cosmologist" upon whose work Boethius most directly builds his model is Plato, whose *Timaeus* predates the authors death in 347 B.C. Another Greek antecedent of Boethius, Pythagoras, seems to have been "the first natural philosopher to use the word *Cosmos* to refer to the general world order" (Diamandopoulos 80).

James A. Connor describes the legacy that Boethius inherited to explain the force of gravity and of the movement of the heavenly spheres: "Aristotle and Ptolemy had invented a system anyone could see at work in a glass jar, watching light things separate out from heavy. Then they could step outside and watch the heavens waltz across the sky like gods in evening ware, and they could say, 'Of course!'" (64-5). Their universe was understood intuitively: earth is below water, which is below air, which is below fire, and each element seeks its proper place in the system; *terra firma* remains motionless while the sun and other stars move around it. Any observer can affirm this through sense data. Beginning at least with Copernicus and continuing through today, the universe has been understood in continuously more-and-more counterintuitive models: the earth appears to stand still, but in fact it rotates on its axis and revolves around the sun; the heavenly spheres appear to move in perfect harmony, but in fact more chaos surrounds us than we sometimes would like to admit; matter and energy appear to be separate categories, but in fact they are interchangeable; time and space appear to be two distinct categories, but in fact they are inseparable. There is much in Boethius's cosmological model that allows readers to place him among his intuitive antecedents, but there are also elements in Boethius, as will be indicated below, that anticipate a Renaissance and post-Renaissance quality of mind that seeks to perceive a counterintuitive reality that underlies the appearance of thing. Taking note of this quality of mind and comparing Boethius's work with later developments in cosmological models can foster an appreciation of Boethius as one who thought seriously and deeply as a natural philosopher or scientist.

That Boethius was a transmitter of ancient knowledge, in both the non-arithmetic (*trivium*) and in the arithmetic (*quadrivium*) divisions of that knowledge is established. Assessing the significance of his work in effecting such transmission, Cassiodorus apostrophizes: “By your translations Latin readers now have Pythagora's music, Ptolemy's astronomy, Nichomachus' arithmetic, Plato's theology, Aristotle's logic, and Archimede's mechanics” (qtd. in Chadwick 103). Some of these works, such as the astronomy, do not exist today, but Boethius's panoptic view certainly encompassed the scientific learning of his day. Within the arithmetic studies, Boethius paired astronomy with geometry [which is a conjunction that Einstein also makes], just as he paired arithmetic with music. Boethius's pairing of Ptolemy and Euclid helps him to make structures drawn in the *Consolation of Philosophy* visually clear. For example, Boethius writes that:

> [the deity's mind,] firmly placed in the citadel of its own simplicity of nature, established the manifold manner in which all things behave. . . . For *providence* embraces all things together, though they are different, though they are infinite; but *fate* arranges as to their motion separate things, distributed in place, form and time; so that this *unfolding of temporal order being united in the foresight of the divine mind is providence*, and *the same unity distributed and unfolding in time is called fate*. (my emphases; Book IV, prose vi, 26-32)

This construct follows from the first premise that Lady Philosophy establishes in her treatment of the patient Boethius (Book I, prose vi, 5-13): the universe moves in rational fashion, and its operations are regular and orderly (cosmic) rather than random and disorderly (chaotic). The Boethian cosmological model distinguishes two realms, that of eternity and that of time: the realm of eternity has no temporal and spatial dimensions while the realm of time has both temporal and spatial dimensions. Geometrically, the temporal dimension is conceived as a finite sphere in which the planets revolve around the earth and through which time takes its course, chronologically, step-by-step, constituting history as it does so, and in the eternal realm, beyond that sphere of space and time, an observing deity is conceived as a geometric point-the only Euclidean figure that has no temporal or spatial dimensions-infinite in simplicity, which is referred to technically today as null infinity. As Boethius elsewhere describes it, the "unmoving and simple form of the way things are done is providence, and fate [history] is the moveable interlacing and temporal ordering of those things which the divine simplicity has disposed to be done" (Book IV, prose vi, 55-60).

As noted above, Boethius accepts the Platonic premise that the heavenly spheres move in perfect harmony; however, later "Ptolemaic astronomers needed to add more and more epicycles [“spheres-within-spheres” or “spheres-upon-spheres”] to the system to keep it working. For a long time, they required only twenty-seven epicycles, but by Keplers day, they needed nearly seventy-far too complicated” (Connor 65). A rotating and revolving earth might have seemed counterintuitive or contrary to sense data, but in the geometry used first by Copernicus and later developed by Kepler, positing a rotating and revolving earth actually increased the simplicity of the system as a whole, so it had to be correct. Michio Kaku says that: “With Occam's Razor, Copernicus sliced away the blizzard of epicycles needed to patch up the Ptolemaic system and put the sun at the center of the solar system” (57). Copernicus, in effect, had elevated the concept of simplicity to a scientific principle, finding simplicity to be an integral aspect in the system itself rather than the aspect of an element beyond the system.

Thus, in Boethius's cosmological model, intuitive or sense data allows the establishment of its first premise or first “self-evident truth”: the cosmos is rational, and its operations are regular and orderly. This premise then leads Boethius to postulate further that there is a conscious observer beyond the system who both established and maintains its regularity and order. It is almost as a *credo* that Boethius affirms the causal necessity of positing this conscious, external observer:

> I could never imagine . . . that anything so regular was moved at random or by chance; I know that God the creator watches over and directs his work, nor could there ever be such a time as would deprive me of the certainty of that truth. (Book I, prose vi, 7-11)

In Euclid's *Elements*, written about 300 B.C., “we find mathematics highly developed as an axiomatic, deductive system” (Lindberg 87). Euclid begins his system by defining *a point* ("that which has no part"), from which definition all other geometric definitions derive. Boethius follows this general pattern in developing the argument in the *Consolation of Philosophy* as an axiomatic, deductive system, in which his argument begins and ends with reference to one geometric point: that of "an observer from on high foreknowing all things . . ." (Book V, prose vi, 166-168). Between the iteration and reiteration of that postulated point of departure and return, Lady Philosophy attempts to justify, through her various arguments, the addition of *good* as the adjective that qualifies the singular nature of that foreknowing observer and to derive the logical implications of that qualifying attribute for the system as a whole; she affirms: "reason so much shows that God is good that it proves clearly that perfect good also is in him. For unless he were such, he could not be the principle of all things; for there would be something possessing perfect good more excellent than he, which in this would seem to be prior and more ancient" (Book III, prose x, 27-33).

In the late-1600s, Isaac Newton developed the argument on gravity axiomatically in his book, the *Principia*. His logic, like that of Boethius, was formed on Greek geometry. James Gleick describes Newton's thinking in this way:

> A force draws bodies toward the center of the earth. This force extends all the way to the moon, pulling the moon exactly as it pulls an apple. An identical force-but toward the center of the sun-keeps the earth in orbit. . . . The force points toward the center of bodies, not because of anything special in the centers, but as a mathematical consequence of this final claim: that every particle of matter in the universe attracts every other particle. From this generalization all the rest followed. Gravity is universal. (135)

Boethius approaches the matter of universal gravitation differently. The point from which his argument follows is a combined postulate deriving from the earlier postulate of the external observer and the postulate that it is good: “What binds all things to order, / Governing earth and sea and sky, / Is love” (Book II, meter viii, 13-15). The Boethian concept owes much to Aristotle's premise of an "Unmoved Mover," and Boethius merges it with Plato's premise of the Highest Good:

> This is the love common to all things,
> And they seek to be bound by their end, the good,
> Since in no other way could they endure,
> If the causes that gave them being did not flow back
> Under the power of returning love. (Book IV, meter vi, 44-48)

As one sees in this passage, Boethius effectively “eroticizes” Aristotle, but in a “Platonic” sense: *gravity* for Boethius is the attractive force in the universe and, for lack of a better metaphor, it is referred to as *love*. In all probability, the melding of Aristotelian and Platonic thought that gave this name to the force now called *gravity* accounts for much of the appeal that the *Consolation of Philosophy* held during the Middle Ages: Aristotle's natural philosophy [that posits an “Unmoved Mover”] joined here to Plato's spiritual philosophy [that posits the “Highest Good”] results in a concept acceptable to the Christian Middle Ages. It also goes far in affirming the Christian mind-set ascribed to Boethius.

One of the appeals of Newton's cosmological model for post-Renaissance science is found in its insistent refusal to enter into non-scientific speculation. James Gleick again points out that “The *Principia* marked a fork in the road: thenceforth science and philosophy went separate ways. Newton had removed from the realm of metaphysics many questions about the nature of things-about what exists-and assigns them to a new realm, physics" (184-185). In Newtons description of *how* gravity works, he did not need to describe *why* it works; he did not need to refer to any Aristotelian *final cause* or Boethian *external observer*. "Gravity," Newton wrote, "must be caused by an agent acting constantly according to certain laws, but whether this agent be material or immaterial is a question I have left to the consideration of my readers" (qtd. in Gleick 148). Not only did Newton's work effect a separation of science and philosophy, it also brought into focus a separation between both of them and theology. His model does not posit any observer other than the implicit observational astronomer who collects data and the theoretical physicist who interprets it.

Proceeding to other post-Renaissance developments in theoretical physics, a major quality of mind to be discerned among those who have altered our understanding of the cosmos is that of finding unity where otherwise only difference had been discussed. Noting first that Copernicus provided a more unified blueprint for the solar system than the one that Ptolemy earlier had provided, Owen Gingrich then points out:

> The greatest of scientists have been unifiers, men who found connections that had never before been perceived. Isaac Newton destroyed the dichotomy between celestial and terrestrial motions, forging a common set of laws that applied to the Earth and sky alike. James Clerk Maxwell connected electricity and magnetism, and showed that light was electromagnetic radiation. Charles Darwin envisioned how all living organisms were related through common descent. Albert Einstein tore asunder the separation between matter and energy, linking them through his famous $e = mc^2$ equation. (53)

Einstein's equation of energy and matter resulted from his special theory of relativity, published in 1905. His general theory of relativity, published in 1915, goes further: the *energy-mass* in an area [the gravitational content of a region] is associated with all of *space-time* nearby, or, symbolically, that *gravitational content* = *space-time* (my emphases; see also Bodanis 206). In Boethius, we find an attempt to unify or reconcile the foreknowledge he ascribes to his observer outside of system with the free will he ascribes to his observer inside the system.

Einstein, like Newton before him, formulated his model of the cosmos using the language of mathematics; Boethius, however, formulates his geometric model of the cosmos using the language of words. Speaking of the special perspective enjoyed by the external observer posited for his system, Boethius writes:

> Whatever . . . comprehends and possesses at once the whole fullness of boundless life, and is such that neither is anything future lacking from it, nor has anything past flowed away, that is rightly to be held to be eternal, and that must necessarily both always be present to itself, possessing itself in the present, and hold as present the infinity of moving time. (Book V, prose vi, 25-31)

Speaking, on the other hand, of the perspective of observers who exist within the system Boethius continues: “whatever lives in time proceeds in the present from the past into the future, and there is nothing established in time which can embrace the whole space of its life equally . . .” (Book V, prose vi, 12-14). Thus, Boethius describes two opposing perspectives on time and space; they differ relative to their position either outside or inside of the system, but they both agree upon the simultaneity of events that occur at any point in time. For the external observer, all of space and all of time are simultaneous; for the observer within the system, the passage of time, moment-by-moment, is constant. For both observers, time and space are absolute, and it is upon this point that Lady Philosophy will build her case for understanding divine foreknowledge and mortal free will as simultaneous but independent aspects of the system as a whole. In this way, Boethius, in effect, is attempting to unify or reconcile determinism, as it was understood in his day, with free will.

To illustrate his special theory of relativity, Einstein describes two observers who carry "clocks within space-time and who move relative to each other, while the speed of causality, in this case the speed of light, remains constant: "clocks that are moving relative to each other fall out of synchronization and therefore give different notions of simultaneity" (Green 55). Ten years later, in his general theory of relativity, Einstein brings into his model a description of gravity as a curvature of space-time in response to the presence of energy-mater: "space and time . . . are mutable; they respond to the presence of mass and energy; they are not absolute" (Green 75). In effect, Einstein, like Boethius, focuses on the perspectives of multiple observers, but for Einstein no observer enjoys a position outside of the system. Stated another way, even for two observers within the cosmological model, derived from relativity theories proposed by either Albert Einstein or Henri Poincaré, simultaneity is "electromagnetic coordination grounded in principled agreement" (Galison 307). James Gleick, therefore, is accurate in his assessment that "[t]he observer whom Einstein and his followers returned to science scarcely resembled the observer whom Newton had removed" (186). The absolute in Einsteins cosmology is the speed of causality [for example, the speed of light or of gravitation]; an observer outside of that system would see nothing. An event outside of our causal past will be disconnected from our reality because the boundary of attainable knowledge is defined as the farthest extent that light has traveled. Beyond that limit, there is only darkness.

The cosmological structure that Boethius described about 524 A.D. was limited to astronomical observations that perceived one earth-centered “solar system,” because it was not until *On the Revolutions of the Heavenly Spheres* was published in 1543 that Copernicus demolished the earth-centered universe by describing a sun-centered system. The cosmological structure that Einstein described in 1905 and 1915 was limited to astronomical observations that perceived one galaxy, because it was not until 1929 that Edwin Hubble “demolished the one-galaxy universe theory by demonstrating the presence of other galaxies far beyond the Milky Way” (Kaku 135). For both Boethius and Einstein, the realm of *space and time*, on the one hand, or of *space-time*, on the other, was finite. For Boethius, the mutual attraction between objects within space and time derived from the influence of Eros or Love. For Einstein, the appearance of mutual attraction derived from the curvature of space-time due to the effect of the gravitational content [mass-energy] upon a local region of space-time. The construction of cosmological models has advanced greatly since either theorist wrote.

Stephen Hawking begins his book, *A Brief History of Time,* with an anecdote from the experiences of Bertrand Russell. After he had lectured on the cosmological model current in his day, a woman in the audience challenged him by saying that the world is flat and supported by tower of giant tortoises. Hawking comments upon this woman's statement by raising a few relevant questions: “Most people would find the picture of our universe as an infinite tower of tortoises rather ridiculous, but why do we think we know better?” (1). For our purposes, we may ask what, other than the distance of time [“whatever that may be” (2)], actually separates the cosmology of Boethius from that of

Einstein? Hawking suggests that a proper response is "breakthroughs in physics, made possible in part by fantastic new technologies" (1). Any deficiencies perceived today in the cosmology presented by Boethius in the *Consolation of Philosophy* do not derive so much from a failure to apply good judgment as from changes in the scientific observations and the mathematic tools available to the theorist.

In a very impressive study of Boethius that focuses primarily on his work with the subjects of the *trivium*, John Marenbon makes a general assessment on the *Consolation of Philosophy*. Lady Philosophy asserts that:

> God . . . hears and answers our prayers, and gives out reward and punishment for good and ill behavior. Since we act before his all-seeing gaze, there is a need for us to act well. Boethius does not reply. The final lines of the work are clearly designed to bring a resolution to the questions Boethius raised [concerning divine foreknowledge and freedom of choice], but they leave the reader puzzled and dissatisfied. Philosophy has vindicated human freedom, only to sacrifice it in the space of a couple of lines." (145)

Many modern readers find the Boethian argument dissatisfying to a degree, and some ascribe perceived contradictions to a subtle disjuncture between the argument presented in the text and the author's philosophical position on the issues that are treated. Sometimes this disjuncture is attributed to the author's conscious use of a literary genre referred to as Menippean satire (see, for example, Marenbon159-63). A disjuncture does exist, but in all probability it results from a subconscious intuition that the argument, ostensibly formulated as a complete and consistent statement on the nature and operations of the cosmos, probably falls short of its mark. It was not until Kurt Gödel published his paper, "On Formally Undecidable Propositions of *Principia Mathematica* and Related

Systems," in 1931 that proof existed that mathematical and other propositional systems could not be both consistent and complete. Today, readers understand consciously that Boethius's cosmology cannot achieve both consistency and completeness, and in his day, Boethius must have perceived, at least subconsciously, that he could not achieve full closure in his argument. Marenbon points out that:

> Boethius invented the word "quadrivium" ("four-foul path"; *Arithmetic* I, I, π7) to capture the relation between the four mathematical subjects-they were to be regarded as "paths" because, in Boethius's words, they lead "from the senses . . . to the more certain things of the intelligence"; they were steps on the way to the Neoplatonic philosopher's grasp of the intelligible world." (14)

Thus, using the understanding of psychology available in his day, Boethius, like theorists who followed him, attempted to go beyond purely intuitive or sense data to grasp a counterintuitive, abstract understanding of a reality that lay beyond the appearance of things. It would take centuries of further observation and advances in technology to replace the construction that he provided: as pointed out above, he put to use his vast knowledge of all of the verbal skills available in the *trivium* and the mathematical skills available in the *quadrivium* to produce his cosmological model, and it was widely influential for about a thousand years.

According to ancient Greek Orphic thinkers and poets, chaos existed first, as the total substance of the universe. Chaos then gave birth spontaneously to two other existents: Night and Erebus, or the dwelling place of death. "From darkness and from death Love [Eros] was born, and with its birth, and with its birth, order and beauty [cosmos] began to banish blind confusion [chaos]. Love created Light with its companion, radiant Day" (Hamilton 63-4; see also Graves 30-1). Boethius's antecedent cosmological models came from Greek theorists and their understanding of the attractive force within the cosmos was understood to derive from the appearance of Eros. The empirical direction taken by Renaissance and post-Renaissance cosmologists has led away from the ancient anthropomorphic metaphors and toward more strictly mathematical models. Today's cosmos is certainly more complex and vast than it was at the time of Boethius, and it is far less secure and more uncertain a place in which to dwell. However, Boethius's contributions deserve a place in the history of the development of cosmology: his final book offers cosmic consolation amid the chaos that we have rediscovered beyond the surface appearance of today's universe.

주제어: 서양우주론, 보에티우스, 『철학의 위안』, 유클리드, 알베르트, 아인쉬타인, 뉴튼, 중력, 에로스

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Abstract

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Many studies exist in which the sources of Boethius's scientific understanding of the cosmos are examined. This study reverses that perspective by examining Boethius's scientific understanding as it presages the cosmological observations and theories of Copernicus, Newton, and Einstein. This paper will show that Boethius shares a geometric understanding of the cosmos with Copernicus and Einstein, and that he shares a view of universal gravitation with Newton. It is in the area of gravitation that Boethius adds an element of Eros [actually Amor] to his cosmology. In general, the study indicates that Boethius thought in categories similar to those of Copernicus, Newton, and Einstein, but that the technological observations available to him were not yet so advanced as those available to the other thinkers.

Key Words
Western cosmology, Boethius, *Consolation of Philosophy*, Euclid, Albert Einstein, Newton, gravitation, Eros